

THAT WHICH IS CLAIMED:

1. A string switching apparatus for controllably connecting a plurality of solar array strings to an output power bus comprising:

5 a plurality of field effect transistors electrically connected in parallel with respective solar array strings, each field effect transistor capable of switching between an on state in which an output of the respective solar array string is shunted and an off state in which the output of the respective solar array string is delivered to the output power bus;

10 a plurality of coupling diodes electrically connected between respective solar array strings and the output power bus; and

a digital controller for controllably switching said field effect transistors between the on and off states to thereby control a power level of the output power bus.

15 2. A string switching apparatus according to Claim 1 further comprising a plurality of drive circuits associated with respective field effect transistors and responsive to said digital controller, wherein each drive circuit controllably switches the respective field effect transistor between on and off states in response to
20 commands from said digital controller.

25 3. A string switching apparatus according to Claim 2 further comprising a programmable logic array that includes said plurality of drive circuits for controlling said field effect transistors in response to commands from said digital controller.

4. A string switching apparatus according to Claim 1 wherein said plurality of field of effect transistors comprise a plurality of MOSFETs.

30 5. A string switching apparatus for controllably connecting a plurality of solar array strings to one of an output power bus and an auxiliary power bus, the string switching apparatus comprising:

a plurality of shunt regulators electrically connected in parallel with respective solar array strings, each shunt regulator capable of alternately shunting an output of

the respective solar array string and delivering the output of the respective solar array string to one of the output power bus and the auxiliary power bus;

a plurality of coupling switches electrically connected between respective solar array strings and one of the output power bus and the auxiliary power bus, each coupling switch capable of switching between an on state in which an output of the respective solar array string is delivered to the respective power bus and an off state in which the output of the respective solar array string is directed to the other power bus; and

a controller for controlling said plurality of shunt regulators and said plurality of coupling switches to thereby control the delivery of power to both the output power bus and the auxiliary power bus.

2. A string switching apparatus according to Claim 1 further comprising a plurality of first drive circuits associated with respective coupling switches and responsive to said controller, wherein each first drive circuit controllably switches the respective coupling switch between on and off states in response to commands from said controller.

3. A string switching apparatus according to Claim 2 further comprising a plurality of second drive circuits associated with respective shunt regulators and responsive to said controller, wherein each second drive circuit controllably switches the respective shunt regulator between an on state in which the output of the respective solar array string is shunted and an off state in which the output of the respective solar array string is delivered to one of the output power bus and the auxiliary power bus in response to commands from said controller.

4. A string switching apparatus according to Claim 3 further comprising a programmable logic array that includes said plurality of first and second drive circuits for controlling said coupling switches and said shunt regulators, respectively, in response to commands from said controller.

5. A string switching apparatus according to Claim 1 wherein said plurality of coupling switches are electrically connected between respective solar array strings and the auxiliary power bus such that, in the on state, each coupling

switch delivers the output of the respective solar array string to the auxiliary power bus and, in the off state, each coupling switch delivers the output of the respective solar array string to the output power bus.

5 6 10. A string switching apparatus according to Claim ⁵ wherein said plurality of coupling switches are electrically connected between respective solar array strings and a battery charging bus such that, in the on state, each coupling switch delivers the output of the respective solar array string to the battery charging bus and, in the off state, each coupling switch delivers the output of the respective
10 solar array string to the output power bus.

7 11. A string switching apparatus according to Claim ¹ further comprising a plurality of coupling diodes electrically connected between respective solar array strings and both the output power bus and the auxiliary power bus.

15 8 12. A string switching apparatus according to Claim ¹ wherein said plurality of coupling diodes comprise:

a plurality of output power coupling diodes electrically connected between respective solar array strings and the output power bus; and

20 a plurality of auxiliary power coupling diodes electrically connected between respective solar array strings and the auxiliary power bus.

9 13. A string switching apparatus according to Claim ¹ wherein said plurality of shunt regulators comprise a plurality of field of effect transistors.

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14. A method of controllably connecting a plurality of solar array strings to one of an output power bus and an auxiliary power bus, the method comprising:
selectively directing an output of each solar array string to one of the output power bus, the auxiliary power bus and a shunt path such that the output power bus and the auxiliary power bus are maintained at respective predetermined power levels,
30 wherein said selective direction of the output of each solar array string comprises:
actuating a shunt regulator in instances in which the output of a respective solar array string is to be directed to the shunt path and deactuating the shunt regulator in instances in which the output of the respective solar

array string is to be directed to one of the output power bus and the auxiliary power bus; and

switchably connecting the output of the respective solar array string to one of the output power bus and the auxiliary power bus in instances in which the power is to be delivered to the respective power bus and switchably disconnecting the output of the respective solar array string from the respective power bus in instances in which the power is to be delivered to the other power bus.

10 ¹¹ ~~15~~. A method according to Claim ¹⁰ ~~14~~ further comprising monitoring the respective power levels of the output power bus and the auxiliary power bus such that the selective direction of the output of each solar array string is based upon the monitored power levels.

15 ¹² ~~16~~. A method according to Claim ¹⁰ ~~14~~ wherein said switchably connecting and disconnecting comprises switchably connecting the output of the respective solar array string to the auxiliary power bus in instances in which the power is to be delivered to the auxiliary power bus and switchably disconnecting the output of the respective solar array string from the auxiliary power bus in instances in which the
20 power is to be delivered to the output power bus.

25 ¹³ ~~17~~. A method according to Claim ¹² ~~16~~ wherein the auxiliary power bus is a battery charging bus, and wherein said switchably connecting and disconnecting comprises switchably connecting the output of the respective solar array string to the battery charging bus in instances in which the power is to be delivered to the battery charging bus and switchably disconnecting the output of the respective solar array string from the battery charging bus in instances in which the power is to be delivered to the output power bus.

30 ¹⁴ ~~18~~. A method according to Claim ¹⁰ ~~14~~ wherein the shunt regulator comprises a field effect transistor, and wherein actuating the shunt regulator comprises switching the field effect transistor to an on state and deactuating the shunt regulator comprises switching the field effect transistor to an off state.

- ¹⁵₁₈ A method according to Claim ¹⁴₁₈ wherein each solar array string is switchably connected to one of the output power bus and the auxiliary power bus by a field effect transistor, wherein switchably connecting the output of the respective solar array string to one of the output power bus and the auxiliary power bus comprises
- 5 switching the respective field effect transistor to an on state, and wherein switchably disconnecting the output of the respective solar array string from the respective power bus comprises switching the respective field effect transistor to an off state.